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Publication No. 11-295901
Publication Date 1999-10-29
Application No. 10-116161
File Date 1998-04-10

Begin Translation:

CLAIMS

[Claim 1] The aligner characterized by having the surface plate which has hollow structure while the stage equipment and the; aforementioned stage equipment with which it is the aligner which imprints to a substrate the pattern formed in the mask, and the aforementioned substrate is laid are carried free [attachment and detachment], and;

[Claim 2] The aligner according to claim 1 characterized by having further the stand carried in the aforementioned surface plate, and; while holding the projection optical system and the; aforementioned projection optical system which project the pattern image of the aforementioned mask on the aforementioned substrate.

[Claim 3] The aforementioned stage equipment is an aligner according to claim 2 which has the move member which holds the aforementioned substrate and moves, and is characterized by carrying the aforementioned stage equipment and the aforementioned stand in the aforementioned surface plate through a vibrationproofing member different, respectively.

[Claim 4] the aforementioned stage equipment -- a base member and this base -- a member -- the move member which moves in a top -- having -- the aforementioned base -- the aligner according to claim 1 characterized by forming the crevice in the aforementioned surface plate of a member, and the field which counters

DETAILED DESCRIPTION

[0001]

[The technical field to which invention belongs] this invention relates to an aligner and relates to the aligner used in more detail at the lithography process which manufactures a liquid crystal display element, a semiconductor device, etc.

[0002]

[Description of the Prior Art] For example, at the lithography process which manufactures a liquid crystal display element, the projected type aligner (the so-called liquid crystal stepper) of a step-and-repeat method or the scanned type aligner which used two or more projection optical systems is used.

[0003] A part of composition of the conventional aligner 100 for liquid crystal display-panel manufacture fractures in drawing 3 , and it is roughly shown in it. This aligner 100 The illumination system 101 and Reticle R which illuminate Reticle

R by the lighting light for exposure including the light source are held. While the reticle stage 103 moved slightly in the XY two-dimensional direction on the reticle base 104, the reticle system attaching part 105 holding the reticle base 104, and this reticle system attaching part 105 are implanted in the upper surface. The glass plate 112 is held on the stand 109 which supports the lens attaching part 107 holding the projection lens PL, and this lens attaching part 107 from a lower part, and this stand 109. It has the aligner main part which consists of the stage equipment 120 grade containing the plate electrode holder 113 which carries out XY two-dimensional movement. The stand 109 which constitutes this aligner main part is laid on the stand vibrationproofing putt 110 arranged on a surface plate 111. [0004] The aforementioned stage equipment 120 is equipped with the base 116 where Y guide (illustration ellipsis) was formed in the upper surface, the Y stage 115 where it moves in the direction of Y along with Y guide, the X stage 114 which moves in the direction of X in this Y stage 115 top, and the plate electrode-holder 13 grade laid on this X stage 114.

[0005] Moreover, the lighting attaching part 108 holding an illumination system 101 is implanted in the upper surface of a stand 109. Moreover, the reticle alignment section 102 in which the non-illustrated reticle microscope was built is formed above the reticle stage 103.

[0006]

[Problem(s) to be Solved by the Invention] By the way, in this kind of aligner, it is important to imprint the pattern of a reticle correctly on an exposed substrate (projection exposure). For this reason, each part of composition of equipment is adjusted and, generally conveying this aligner is performed with the state which adjustment completed, i.e., the state where the whole equipment was assembled.

[0007] However, in order to use what also has very large-sized stage equipment with which the thing of a 500mmx600mm large area is also used by 0.7mm in thickness now, and this glass substrate is laid and for the glass substrate for liquid crystal to expose the whole surface of the glass substrate of a parenthesis, the base section which X stage and Y stage move needs to use the thing of a large area further.

[0008] Furthermore, it is said that a glass substrate will be set to 1mx1m, enlargement of stage equipment including the base, as a result weight-izing of an aligner are inevitable, and conveying, where an aligner is assembled like before is expected very much with difficulty in the future.

[0009] Moreover, by the conventional aligner, since the stand 109 with which stage equipment 120 was carried had the rectangle frame-like configuration by ***** , there was little space of the stage equipment 120 circumference, and un-arranging [that it was not good] also had the workability at the time of a maintenance of projection lens PL and others, so that clearly also from drawing 3 .

[0010] this invention was made under this situation and the purpose is in offering the aligner which can aim at easy-izing of conveyance work, and improvement in maintenance nature.

[0011]

[Means for Solving the Problem] Invention according to claim 1 is an aligner which imprints the pattern formed in the mask (R) to a substrate (P), and it is characterized by having the surface plate (20) which has hollow structure, and; while the stage equipment (16) and the; aforementioned stage equipment with which the aforementioned substrate is laid are carried free [attachment and detachment].

[0012] It is the meaning which includes not only when the surface plate itself is "having hollow structure" with hollow structure, but the case where space is formed between an installation floor and a surface plate where a surface plate is installed in an installation floor here.

[0013] Since the stage equipment with which a substrate is laid is carried on the surface plate free [attachment and detachment], while the workability at the time of a maintenance improves by removing stage equipment from on a surface plate according to invention given in this claim 1 Since this aligner can be conveyed where stage equipment is removed from on a surface plate, even if it is the case where stage equipment is enlarged with enlargement of a substrate, conveyance work can be done easily.

[0014] In this case, while holding the projection optical system (PL) and the; aforementioned projection optical system which project the pattern image of the aforementioned mask (R) on the aforementioned substrate (P) like invention according to claim 2, you may have further the stand (18) and; which were carried in the aforementioned surface plate. In this case, the maintenance work of the projection optical system held at the stand or the optical member around it, for example, an alignment system etc., becomes easy by removing stage equipment from on a surface plate.
 [0015] In this case, as for the aforementioned stage equipment (16), it is desirable like invention according to claim 3 to be carried in the aforementioned surface plate (20) through a vibrationproofing member (22 24) which has the move member (14) which holds the aforementioned substrate (P) and moves, and is different from the aforementioned stage equipment and the aforementioned stand (18), respectively. since it is carried in the surface plate through a vibrationproofing member which is different from stage equipment and the aforementioned stand, respectively in this case -- movement -- it can prevent that vibration resulting from the reaction force produced at the time of the acceleration and deceleration of a member stops getting across to a stand side, and an optical-axis gap of the projection optical system based on the vibration etc. arises

[0016] an aligner given in the above-mentioned claim 1 -- setting -- like invention according to claim 4 -- the aforementioned stage equipment (16) -- a base member (40) and this base -- a member -- the case where it has the move member (14) which moves in a top -- the aforementioned base -- the crevice (40a, 40b) may be formed in the aforementioned surface plate (20) of a member, and the field which counters this case -- the base -- since the fork of the fork lift truck for conveyance can be made to engage with the crevice of a member, stage equipment can be certainly conveyed in the position of the request on a surface plate

[0017]

[Embodiments of the Invention] Hereafter, 1 operation gestalt of this invention is explained based on drawing 1 and drawing 2 . A part of composition of the aligner 10 concerning 1 operation gestalt fractures in drawing 1 , and it is roughly shown in it.

[0018] This aligner 10 is the projection aligner of the step-and-repeat method for liquid crystal display manufacture, and the so-called liquid crystal stepper.

[0019] The reticle stage RST which this aligner 10 holds the illumination system 12 and Reticle R which illuminate the reticle R as a mask, and is moved slightly in XY two-dimensional side, The projection lens PL as a projection optical system which projects the pattern of Reticle R on the glass plate (henceforth a "plate") P as a substrate And it has the stage equipment 16 grade containing the substrate table

14 as a move member which holds Plate P and moves in the XY two-dimensional direction.

[0020] Although the illumination system 12, the reticle stage RST, the projection optical system PL, etc. are carried in the same stand 18 in this aligner 10, stage equipment 16 is separated from the stand 18. That is, a stand 18 is supported by two or more stand vibration absorbing pads 22 as a vibrationproofing member arranged on a surface plate 20, and stage equipment 16 is supported in parallel, i.e., horizontally, by two or more stage vibration absorbing pads 24 as another vibrationproofing member arranged on a surface plate 20 on the upper surface of a surface plate 20.

[0021] Ellipse mirror 12a to which the aforementioned illumination system 12 condenses the non-illustrated light source and the light in which light was emitted with this light source in the 2nd focal position, The wavelength-selection filter which is made to penetrate alternatively only the specific wavelength of the light condensed by this ellipse mirror 12a, and is changed into exposure light, Reticle R is illuminated with a uniform illuminance by the exposure light of predetermined wavelength including illuminance equalization optical system, a field diaphragm (reticle blind), etc. containing the optical integrator which equalizes the illuminance of the exposure light (all are illustration ellipses). This illumination system 12 is held through the lighting attaching part 26 on the upper surface of a stand 18.

[0022] Opening 18a of a cross-section round shape is formed in the vertical direction, the lens attaching part 28 by which flange 28a was prepared in this opening 18a at the upper-limit section is inserted in the center section of the upper wall of the aforementioned stand 18 from the upper part, and it is held at the stand 18. Crevice 28b with the circular predetermined depth is formed in the upper surface side of the center section of the lens attaching part 28, and circular opening 28c penetrated in the vertical direction from crevice 28b in a minor diameter is formed in the center section of this crevice 28b. the lower part of the projection lens PL inserts into this opening 28c -- having -- the shaft-orientations Chuo -- the projection lens PL is held by the lens attaching part 28 in the state where the flange 30 prepared a little in soffit approach contacts the inner base of crevice 28b In this case, both adjustment is made so that the optical axis AX of the projection lens PL and the optical axis IX of an illumination system 12 may be in agreement.

[0023] The cylinder-like reticle system attaching part 32 is set up by the upper surface of the lens attaching part 28, and the reticle base 34 which supports the aforementioned reticle stage RST on the upper surface of this reticle system attaching part 32 is being horizontally fixed to it.

[0024] The very small drive of the reticle stage RST is carried out in the XY two-dimensional direction by Motors 36A and 36B in the reticle base 34 top. Moreover, the reticle alignment section 38 in which the non-illustrated reticle microscope was built is arranged in this reticle-stage RST upper part.

[0025] The perspective diagram of stage equipment 16 is shown in drawing 2 . As shown in this drawing 2 , stage equipment 16 the base of a rectangle tabular -- a member 40 and this base -- with the Y stage 42 where it moves in the direction of Y along with V flat guide installed in the direction of Y by the upper surface of a member 40 The X stage 44 where it moves in the direction of X along with V flat guide installed in the direction of X by the upper surface of this Y stage 42, The upper surface of the aforementioned substrate table 14 carried in the upper surface of this X stage 44 and the substrate table 14 is equipped with the plate electrode

holder 46 positioned with the positioning roller. The Y stage 42 is driven by the motor 50 through feed screw 48Y, and drives the X stage 44 by the motor 52 through feed screw 48X. Moreover, in accordance with Z shaft orientations, the very small drive of the substrate table 14 is carried out by the non-illustrated drive system at the circumference of vertical movement and the Z-axis. Moreover, X move mirror 54X ** Y move mirror 54Y is fixed to the upper surface of the substrate table 14, respectively, and the position of the substrate table 14 is measured by the non-illustrated laser interferometer through these.

[0026] furthermore -- this operation form -- the base -- the crevices 40a and 40b of the couple prolonged by predetermined length in the direction of Y are formed in the base of a member 40

[0027] it returns to drawing 1 and rectangular height 24a forms [the cross section] in the upper surface of each stage vibration absorbing pad 24 -- having -- this -- corresponding -- the base -- crevice 40c into which height 24a fits is formed in the base of a member 40 That is, with this operation form, while stage equipment 16 is carried free [attachment and detachment] to the stage vibration absorbing pad 24, the relative-position relation between the stage vibration absorbing pad 24 and stage equipment 16 also becomes settled uniquely.

[0028] Moreover, as the aforementioned surface plate 20, as shown in drawing 1 , that in which the centrum prolonged in the direction of Y in a cross-section rectangle at intervals of predetermined was prepared is used. This surface plate 20 is equipped also with the duty which specifies the physical relationship of the stage vibration absorbing pad 24 and the stand vibration absorbing pad 22 in a predetermined relation so that drawing 1 may also show.

[0029] Furthermore, above Plate P, the plate alignment sensor PAS is arranged and it is held by the lens attaching part 28 in the position which counters four corners of this plate P.

[0030] From the stage equipment 16 with which Plate P is laid being carried on a surface plate 20 free [attachment and detachment] through the stage vibration absorbing pad 24 according to the aligner 10 of this operation gestalt constituted as mentioned above By removing stage equipment 16 from on a surface plate 20, the caudad big space of the lens attaching part 28 can be made, and the workability at the time of the maintenance of the optic which is attached to the projection lens PL, the plate alignment sensor PAS, and them by this improves. Moreover, since what has hollow structure as a surface plate 20 is used, it can convey easily in the state [having assembled the aligner 10] by inserting conveyance members, such as a fork of a fork lift truck, in the centrum of this surface plate 20. Moreover, even if it is the case where Plate P was enlarged and stage equipment 16 is enlarged in connection with this, it can convey easily in the state [having assembled portions other than stage equipment 16, where stage equipment 16 is removed from on a surface plate 20].

[0031] moreover, from stage equipment 16 and the stand 18 being carried in the surface plate 20 through the stage vibration absorbing pad 24 and the stand vibration absorbing pad 22, respectively In the case of movement of the X stage 44 which constitutes stage equipment 16, or the Y stage 42 For example, the vibration resulting from the reaction force produced at the time of the acceleration and deceleration of the X stage 44 in the case of positioning of the plate P at the time of exposure or the Y stage 42 It can prevent that stop getting across to a stand 18 side, and the optical-axis gap of the projection lens PL based on the vibration etc. arises, and enables this to aim at improvement in exposure precision.

[0032] Moreover, since it is not necessary to make rigidity of a stand 18 and the lighting attaching part 26, the lens attaching part 28, and the reticle system attaching part 32 not much high even if vibration which originates in the reaction force at the time of stage acceleration and deceleration as mentioned above is the case where the drive speed of the X stage 44 and the Y stage 42 is raised for the improvement in a throughput, since it stops getting across to a stand 18 side, lightweight-ization of those members is attained.

[0033] moreover, the base which constitutes stage equipment 16, since Crevices 40a and 40b are formed in the inferior surface of tongue (a surface plate 20 and field which counters) of a member 40 The forks 60A and 60B of the fork lift truck for conveyance can be made to engage with the crevices 40a and 40b of a member 40. it is shown in drawing 2 -- as -- the base -- thereby Stage equipment 16 can be certainly conveyed on the stage vibration absorbing pad 24 positioned on the surface plate 20. and heights 24a of the upper surface of the stage vibration absorbing pad 24 -- receiving -- the base -- a member -- stage equipment 40 can be positioned to a position by one-touch by making crevice 40c of 40 inferior surface of tongue fit in

[0034] moreover, the base -- what is necessary is to relate with the size of the centrum of a surface plate 20, and just to make it decide the size of the crevices 40a and 40b of a member 40 so that conveyance of stage equipment and conveyance of an aligner 10 can be performed in the same transport device (fork lift truck)

[0035] In addition, although the above-mentioned operation gestalt explained the case where stage equipment 16 was carried free [attachment and detachment] on a surface plate 20 through a vibration absorbing pad 24, this invention may not be limited to this and stage equipment 16 may be directly carried free [attachment and detachment] on the surface plate 20. Moreover, even if it is the case where stage equipment 16 is carried on a surface plate 20 through a vibration absorbing pad 24, you may make it the structure which can detach and attach a vibration absorbing pad 24 and a surface plate 20 freely.

[0036] Moreover, although the above-mentioned operation gestalt explained the case where surface plate 20 itself had hollow structure, you may use the thing of the configuration in which the bottom wall which has at least two legs as a surface plate does not exist so that space may be formed between an installation floor and a surface plate, where not only this but a surface plate is installed in an installation floor.

[0037] Moreover, although the above-mentioned operation gestalt explained the case where this invention was applied to the stepper for liquid crystal, the scope of this invention is not limited to this, and this invention can be suitably applied also to the aligner for semiconductors, and other aligners.

[0038]

[Effect of the Invention] As explained above, according to this invention, there are easy-izing and the outstanding effect that it can install and shortening of time and improvement in maintenance nature can be aimed at of conveyance work.

TECHNICAL FIELD

[The technical field to which invention belongs] this invention relates to an aligner and relates to the aligner used in more detail at the lithography process which manufactures a liquid crystal display element, a semiconductor device, etc.

PRIOR ART

[Description of the Prior Art] For example, at the lithography process which manufactures a liquid crystal display element, the projected type aligner (the so-called liquid crystal stepper) of a step-and-repeat method or the scanned type aligner which used two or more projection optical systems is used.

[0003] A part of composition of the conventional aligner 100 for liquid crystal display-panel manufacture fractures in drawing 3, and it is roughly shown in it. This aligner 100 The illumination system 101 and Reticle R which illuminate Reticle R by the lighting light for exposure including the light source are held. While the reticle stage 103 moved slightly in the XY two-dimensional direction on the reticle base 104, the reticle system attaching part 105 holding the reticle base 104, and this reticle system attaching part 105 are implanted in the upper surface The glass plate 112 is held on the stand 109 which supports the lens attaching part 107 holding the projection lens PL, and this lens attaching part 107 from a lower part, and this stand 109. It has the aligner main part which consists of the stage equipment 120 grade containing the plate electrode holder 113 which carries out XY two-dimensional movement. The stand 109 which constitutes this aligner main part is laid on the stand vibrationproofing putt 110 arranged on a surface plate 111. [0004] The aforementioned stage equipment 120 is equipped with the base 116 where Y guide (illustration ellipsis) was formed in the upper surface, the Y stage 115 where it moves in the direction of Y along with Y guide, the X stage 114 which moves in the direction of X in this Y stage 115 top, and the plate electrode-holder 13 grade laid on this X stage 114.

[0005] Moreover, the lighting attaching part 108 holding an illumination system 101 is implanted in the upper surface of a stand 109. Moreover, the reticle alignment section 102 in which the non-illustrated reticle microscope was built is formed above the reticle stage 103.

EFFECT OF THE INVENTION

As explained above, according to this invention, there are easy-izing and the outstanding effect that it can install and shortening of time and improvement in maintenance nature can be aimed at of conveyance work.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By the way, in this kind of aligner, it is important to imprint the pattern of a reticle correctly on an exposed substrate (projection exposure). For this reason, each part of composition of equipment is adjusted and, generally conveying this aligner is performed with the state which adjustment completed, i.e., the state where the whole equipment was assembled.

[0007] However, in order to use what also has very large-sized stage equipment with which the thing of a 500mmx600mm large area is also used by 0.7mm in thickness now, and this glass substrate is laid and for the glass substrate for liquid crystal to expose the whole surface of the glass substrate of a parenthesis, the base section which X stage and Y stage move needs to use the thing of a large area further.

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aligner are inevitable, and conveying, where an aligner is assembled like before is expected very much with difficulty in the future.

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[0010] this invention was made under this situation and the purpose is in offering the aligner which can aim at easy-izing of conveyance work, and improvement in maintenance nature.

MEANS

[Means for Solving the Problem] Invention according to claim 1 is an aligner which imprints the pattern formed in the mask (R) to a substrate (P), and it is characterized by having the surface plate (20) which has hollow structure, and; while the stage equipment (16) and the; aforementioned stage equipment with which the aforementioned substrate is laid are carried free [attachment and detachment] .

[0012] It is the meaning which includes not only when the surface plate itself is "having hollow structure" with hollow structure, but the case where space is formed between an installation floor and a surface plate where a surface plate is installed in an installation floor here.

[0013] Since the stage equipment with which a substrate is laid is carried on the surface plate free [attachment and detachment] , while the workability at the time of a maintenance improves by removing stage equipment from on a surface plate according to invention given in this claim 1 Since this aligner can be conveyed where stage equipment is removed from on a surface plate, even if it is the case where stage equipment is enlarged with enlargement of a substrate, conveyance work can be done easily.

[0014] In this case, while holding the projection optical system (PL) and the; aforementioned projection optical system which project the pattern image of the aforementioned mask (R) on the aforementioned substrate (P) like invention according to claim 2, you may have further the stand (18) and; which were carried in the aforementioned surface plate. In this case, the maintenance work of the projection optical system held at the stand or the optical member around it, for example, an alignment system etc., becomes easy by removing stage equipment from on a surface plate.

[0015] In this case, as for the aforementioned stage equipment (16), it is desirable like invention according to claim 3 to be carried in the aforementioned surface plate (20) through a vibrationproofing member (22 24) which has the move member (14) which holds the aforementioned substrate (P) and moves, and is different from the aforementioned stage equipment and the aforementioned stand (18), respectively. since it is carried in the surface plate through a vibrationproofing member which is different from stage equipment and the aforementioned stand, respectively in this case -- movement -- it can prevent that vibration resulting from the reaction force produced at the time of the acceleration and deceleration of a member stops getting across to a stand side, and an optical-axis gap of the projection optical system based on the vibration etc. arises

[0016] an aligner given in the above-mentioned claim 1 -- setting -- like invention

according to claim 4 -- the aforementioned stage equipment (16) -- a base member (40) and this base -- a member -- the case where it has the move member (14) which moves in a top -- the aforementioned base -- the crevice (40a, 40b) may be formed in the aforementioned surface plate (20) of a member, and the field which counters this case -- the base -- since the fork of the fork lift truck for conveyance can be made to engage with the crevice of a member, stage equipment can be certainly conveyed in the position of the request on a surface plate

[0017]

[Embodiments of the Invention] Hereafter, 1 operation gestalt of this invention is explained based on drawing 1 and drawing 2. A part of composition of the aligner 10 concerning 1 operation gestalt fractures in drawing 1, and it is roughly shown in it.

[0018] This aligner 10 is the projection aligner of the step-and-repeat method for liquid crystal display manufacture, and the so-called liquid crystal stepper.

[0019] The reticle stage RST which this aligner 10 holds the illumination system 12 and Reticle R which illuminate the reticle R as a mask, and is moved slightly in XY two-dimensional side, The projection lens PL as a projection optical system which projects the pattern of Reticle R on the glass plate (henceforth a "plate") P as a substrate And it has the stage equipment 16 grade containing the substrate table 14 as a move member which holds Plate P and moves in the XY two-dimensional direction.

[0020] Although the illumination system 12, the reticle stage RST, the projection optical system PL, etc. are carried in the same stand 18 in this aligner 10, stage equipment 16 is separated from the stand 18. That is, a stand 18 is supported by two or more stand vibration absorbing pads 22 as a vibrationproofing member arranged on a surface plate 20, and stage equipment 16 is supported in parallel, i.e., horizontally, by two or more stage vibration absorbing pads 24 as another vibrationproofing member arranged on a surface plate 20 on the upper surface of a surface plate 20.

[0021] Ellipse mirror 12a to which the aforementioned illumination system 12 condenses the non-illustrated light source and the light in which light was emitted with this light source in the 2nd focal position, The wavelength-selection filter which is made to penetrate alternatively only the specific wavelength of the light condensed by this ellipse mirror 12a, and is changed into exposure light, Reticle R is illuminated with a uniform illuminance by the exposure light of predetermined wavelength including illuminance equalization optical system, a field diaphragm (reticle blind), etc. containing the optical integrator which equalizes the illuminance of the exposure light (all are illustration abbreviations). This illumination system 12 is held through the lighting attaching part 26 on the upper surface of a stand 18.

[0022] Opening 18a of a cross-section round shape is formed in the vertical direction, the lens attaching part 28 by which flange 28a was prepared in this opening 18a at the upper-limit section is inserted in the center section of the upper wall of the aforementioned stand 18 from the upper part, and it is held at the stand 18. Crevice 28b with the circular predetermined depth is formed in the upper surface side of the center section of the lens attaching part 28, and circular opening 28c penetrated in the vertical direction from crevice 28b in a minor diameter is formed in the center section of this crevice 28b. the lower part of the projection lens PL inserts into this opening 28c -- having -- the shaft-orientations Chuo -- the projection lens PL is held by the lens attaching part 28 in the state where the flange 30 prepared a little in soffit approach contacts the inner base of

crevice 28b In this case, both adjustment is made so that the optical axis AX of the projection lens PL and the optical axis IX of an illumination system 12 may be in agreement.

[0023] The cylinder-like reticle system attaching part 32 is set up by the upper surface of the lens attaching part 28, and the reticle base 34 which supports the aforementioned reticle stage RST on the upper surface of this reticle system attaching part 32 is being horizontally fixed to it.

[0024] The very small drive of the reticle stage RST is carried out in the XY two-dimensional direction by Motors 36A and 36B in the reticle base 34 top. Moreover, the reticle alignment section 38 in which the non-illustrated reticle microscope was built is arranged in this reticle-stage RST upper part.

[0025] The perspective diagram of stage equipment 16 is shown in drawing 2 . As shown in this drawing 2 , stage equipment 16 the base of a rectangle tabular -- a member 40 and this base -- with the Y stage 42 where it moves in the direction of Y along with V flat guide installed in the direction of Y by the upper surface of a member 40 The X stage 44 where it moves in the direction of X along with V flat guide installed in the direction of X by the upper surface of this Y stage 42, The upper surface of the aforementioned substrate table 14 carried in the upper surface of this X stage 44 and the substrate table 14 is equipped with the plate electrode holder 46 positioned with the positioning roller. The Y stage 42 is driven by the motor 50 through feed screw 48Y, and drives the X stage 44 by the motor 52 through feed screw 48X. Moreover, in accordance with Z shaft orientations, the very small drive of the substrate table 14 is carried out by the non-illustrated drive system at the circumference of vertical movement and the Z-axis. Moreover, X move mirror 54X ** Y move mirror 54Y is fixed to the upper surface of the substrate table 14, respectively, and the position of the substrate table 14 is measured by the non-illustrated laser interferometer through these.

[0026] furthermore -- this operation form -- the base -- the crevices 40a and 40b of the couple prolonged by predetermined length in the direction of Y are formed in the base of a member 40

[0027] it returns to drawing 1 and rectangular height 24a forms [the cross section] in the upper surface of each stage vibration absorbing pad 24 -- having -- this -- corresponding -- the base -- crevice 40c into which height 24a fits is formed in the base of a member 40 That is, with this operation form, while stage equipment 16 is carried free [attachment and detachment] to the stage vibration absorbing pad 24, the relative-position relation between the stage vibration absorbing pad 24 and stage equipment 16 also becomes settled uniquely.

[0028] Moreover, as the aforementioned surface plate 20, as shown in drawing 1 , that in which the centrum prolonged in the direction of Y in a cross-section rectangle at intervals of predetermined was prepared is used. This surface plate 20 is equipped also with the duty which specifies the physical relationship of the stage vibration absorbing pad 24 and the stand vibration absorbing pad 22 in a predetermined relation so that drawing 1 may also show.

[0029] Furthermore, above Plate P, the plate alignment sensor PAS is arranged and it is held by the lens attaching part 28 in the position which counters four corners of this plate P.

[0030] From the stage equipment 16 with which Plate P is laid being carried on a surface plate 20 free [attachment and detachment] through the stage vibration absorbing pad 24 according to the aligner 10 of this operation gestalt constituted as mentioned above By removing stage equipment 16 from on a surface plate 20,

the caudad big space of the lens attaching part 28 can be made, and the workability at the time of the maintenance of the optic which is attached to the projection lens PL, the plate alignment sensor PAS, and them by this improves. Moreover, since what has hollow structure as a surface plate 20 is used, it can convey easily in the state [having assembled the aligner 10] by inserting conveyance members, such as a fork of a fork lift truck, in the centrum of this surface plate 20. Moreover, even if it is the case where Plate P was enlarged and stage equipment 16 is enlarged in connection with this, it can convey easily in the state [having assembled portions other than stage equipment 16, where stage equipment 16 is removed from on a surface plate 20].

[0031] moreover, from stage equipment 16 and the stand 18 being carried in the surface plate 20 through the stage vibration absorbing pad 24 and the stand vibration absorbing pad 22, respectively In the case of movement of the X stage 44 which constitutes stage equipment 16, or the Y stage 42 For example, the vibration resulting from the reaction force produced at the time of the acceleration and deceleration of the X stage 44 in the case of positioning of the plate P at the time of exposure or the Y stage 42 It can prevent that stop getting across to a stand 18 side, and the optical-axis gap of the projection lens PL based on the vibration etc. arises, and enables this to aim at improvement in exposure precision.

[0032] Moreover, since it is not necessary to make rigidity of a stand 18 and the lighting attaching part 26, the lens attaching part 28, and the reticle system attaching part 32 not much high even if vibration which originates in the reaction force at the time of stage acceleration and deceleration as mentioned above is the case where the drive speed of the X stage 44 and the Y stage 42 is raised for the improvement in a throughput, since it stops getting across to a stand 18 side, lightweight-ization of those members is attained.

[0033] moreover, the base which constitutes stage equipment 16, since Crevices 40a and 40b are formed in the inferior surface of tongue (a surface plate 20 and field which counters) of a member 40 The forks 60A and 60B of the fork lift truck for conveyance can be made to engage with the crevices 40a and 40b of a member 40. it is shown in drawing 2 -- as -- the base -- thereby Stage equipment 16 can be certainly conveyed on the stage vibration absorbing pad 24 positioned on the surface plate 20. and heights 24a of the upper surface of the stage vibration absorbing pad 24 -- receiving -- the base -- a member -- stage equipment 40 can be positioned to a position by one-touch by making crevice 40c of 40 inferior surface of tongue fit in

[0034] moreover, the base -- what is necessary is to relate with the size of the centrum of a surface plate 20, and just to make it decide the size of the crevices 40a and 40b of a member 40 so that conveyance of stage equipment and conveyance of an aligner 10 can be performed in the same transport device (fork lift truck)

[0035] In addition, although the above-mentioned operation gestalt explained the case where stage equipment 16 was carried free [attachment and detachment] on a surface plate 20 through a vibration absorbing pad 24, this invention may not be limited to this and stage equipment 16 may be directly carried free [attachment and detachment] on the surface plate 20. Moreover, even if it is the case where stage equipment 16 is carried on a surface plate 20 through a vibration absorbing pad 24, you may make it the structure which can detach and attach a vibration absorbing pad 24 and a surface plate 20 freely.

[0036] Moreover, although the above-mentioned operation gestalt explained the

case where surface plate 20 itself had hollow structure, you may use the thing of the configuration in which the bottom wall which has at least two legs as a surface plate does not exist so that space may be formed between an installation floor and a surface plate, where not only this but a surface plate is installed in an installation floor.

[0037] Moreover, although the above-mentioned operation gestalt explained the case where this invention was applied to the stepper for liquid crystal, the scope of this invention is not limited to this, and this invention can be suitably applied also to the aligner for semiconductors, and other aligners.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing in which fracturing a part of whole aligner composition of 1 operation gestalt, and showing it roughly.

[Drawing 2] It is the outline perspective diagram showing the stage equipment of drawing 1 .

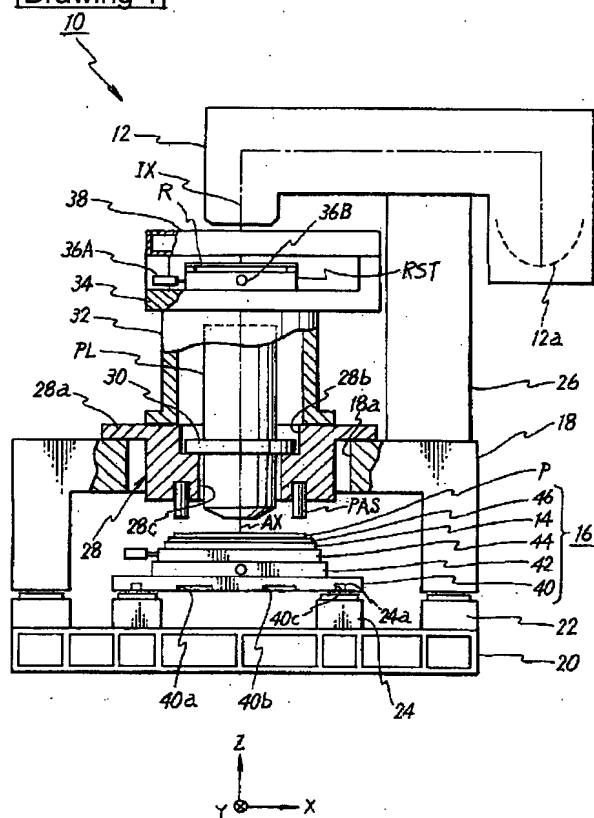
[Drawing 3] It is explanatory drawing showing the conventional example.

[Description of Notations]

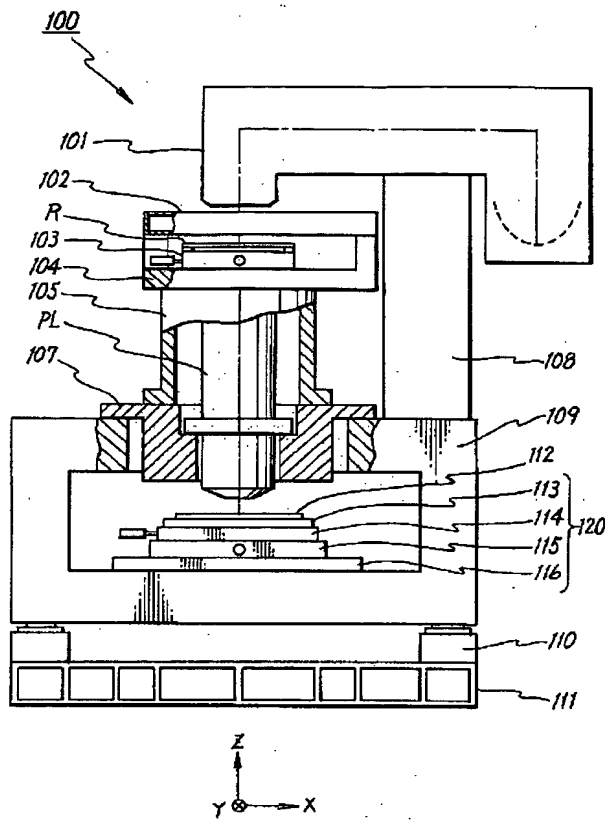
10 [-- Stage equipment, 18 / -- A stand, 20 / -- A surface plate, 22 / -- A stand vibration absorbing pad (vibrationproofing member), 24 / -- A stage vibration absorbing pad (vibrationproofing member), 40 / -- A base member, 40a, 40b / -- A crevice, R / -- A reticle (mask) P / -- A plate (substrate) PL / -- Projection lens (projection optical system)] -- An aligner, 14 -- A substrate table (move member), 16

DRAWINGS

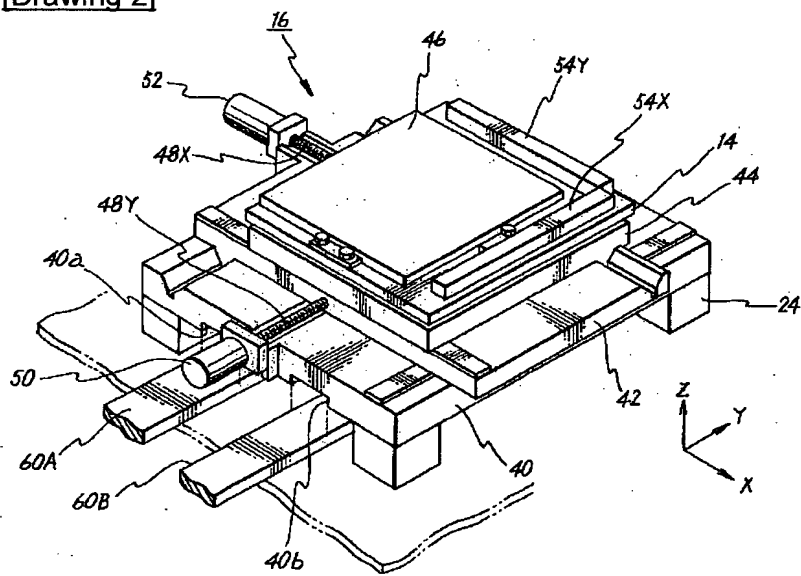
[Drawing 1]



[Drawing 3]



[Drawing 2]



(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平11-295901

(43) 公開日 平成11年(1999)10月29日

(51) Int. CL⁴

識別記号

P I

G 0 3 F 7/22

G 0 3 F 7/22

Z

F 1 6 F 15/02

F 1 6 F 15/02

A

H 0 1 L 21/027

H 0 1 L 21/30

5 1 6 D

5 1 5 G

5 1 6 B

審査請求 未請求 請求項の数4 FD (全6頁)

(21) 出願番号

特願平10-116161

(22) 出願日

平成10年(1998)4月10日

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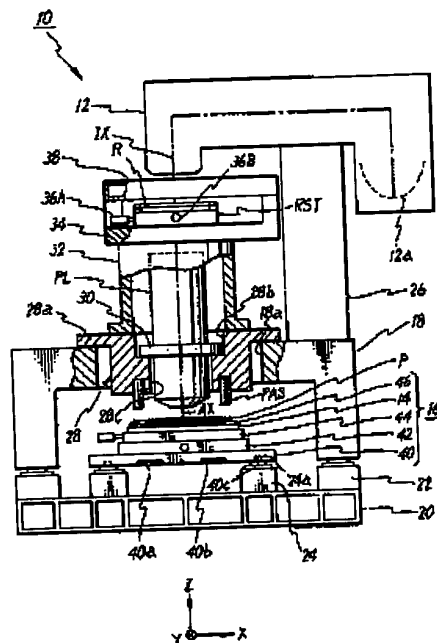
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(54) 【発明の名称】 露光装置

(57) 【要約】

【課題】 搬送作業の容易化及びメンテナンス性の向上を図ることができる露光装置を提供する。

【解決手段】 基板Pが載置されるステージ装置16が防振部材24を介して着脱自在に定盤20上に搭載されている。このため、ステージ装置16を定盤20上から取り外すことにより、メンテナンス時の作業性が向上する。また、ステージ装置16を定盤20上から取り外した状態で該露光装置を搬送することができるので、基板の大型化に伴ってステージ装置が大型化した場合であっても、搬送作業を容易に行うことができる。



【特許請求の範囲】

【請求項1】 マスクに形成されたパターンを基板に転写する露光装置であって、

前記基板が載置されるステージ装置と；前記ステージ装置が着脱自在に搭載されるとともに中空構造を有する定盤と；を備えたことを特徴とする露光装置。

【請求項2】 前記マスクのパターン像を前記基板上に投影する投影光学系と；前記投影光学系を保持するとともに、前記定盤に搭載された架台と；を更に備えたことを特徴とする請求項1に記載の露光装置。

【請求項3】 前記ステージ装置は、前記基板を保持して移動する移動部材を有し、

前記ステージ装置と前記架台とは、それぞれ異なる防振部材を介して前記定盤に搭載されていることを特徴とする請求項2に記載の露光装置。

【請求項4】 前記ステージ装置は、ベース部材と、このベース部材上を移動する移動部材とを有し、前記ベース部材の前記定盤と対向する面には、凹部が形成されていることを特徴とする請求項1に記載の露光装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、露光装置に係り、さらに詳しくは、液晶表示素子、半導体素子等を製造するリソグラフィ工程で用いられる露光装置に関する。

【0002】

【従来の技術】例えば、液晶表示素子を製造するリソグラフィ工程では、ステップ・アンド・リピート方式の投影型露光装置（いわゆる液晶ステップ）、あるいは複数の投影光学系を用いた走査型露光装置などが用いられている。

【0003】図3には、従来の液晶ディスプレイパネル製造用露光装置100の構成が一部破断して概略的に示されている。この露光装置100は、光源を含み露光用照明光によってレチクルRを照明する照明系101、レチクルRを保持してレチクルベース104上でXY2次元方向に微動するレチクルステージ103、レチクルベース104を保持するレチクル系保持部105、このレチクル系保持部105がその上面に植設されるとともに、投影レンズPLを保持するレンズ保持部107、該レンズ保持部107を下方から支持する架台109及びこの架台109上でガラスプレート112を保持してXY2次元移動するプレートホルダ113を含むステージ装置120等から成る露光装置本体を備えている。この露光装置本体を構成する架台109は、定盤111上に配置された架台防振パット110上に載置されている。

【0004】前記ステージ装置120は、その上面にYガイド（図示省略）が形成されたベース116、Yガイドに沿ってY方向に移動するYステージ115、このYステージ115上をX方向に移動するXステージ11

4、このXステージ114上に載置されたプレートホルダ13等を備えている。

【0005】また、架台109の上面には、照明系101を保持する照明保持部108が植設されている。また、レチクルステージ103の上方には、不図示のレチクル顕微鏡が内蔵されたレチクルアライメント部102が設けられている。

【0006】

【発明が解決しようとする課題】ところで、この種の露光装置では、レチクルのパターンを被露光基板上に正確に転写（投影露光）することが重要である。このため、装置の構成各部を調整して、調整が完了した状態、すなわち装置全体を組み立てた状態のまま、該露光装置を搬送することが一般的に行われている。

【0007】しかるに、液晶用のガラス基板は、現在でも厚さ0.7mmで500mm×600mmの大面积のものが用いられており、このガラス基板が載置されるステージ装置も非常に大型のものが用いられており、かつこのガラス基板の全面を露光するためには、Xステージ、Yステージが移動するベース部は更に大面积のものをを用いる必要がある。

【0008】さらに、将来的には、ガラス基板は1m×1mになるであろうと言われており、ベースを含むステージ装置の大型化、ひいては露光装置の重量化は必至であり、従来のように露光装置を組み立てた状態で搬送することは非常に困難を伴うものと予想される。

【0009】また、図3からも明らかなように、従来の露光装置では、ステージ装置120が搭載された架台109が、側面視で矩形枠状の形状を有していることから、ステージ装置120周囲の空間が少なく、投影レンズPLその他のメンテナンス時の作業性が良くないという不都合もあった。

【0010】本発明は、かかる事情の下になされたもので、その目的は、搬送作業の容易化及びメンテナンス性の向上を図ることができる露光装置を提供することにある。

【0011】

【課題を解決するための手段】請求項1に記載の発明は、マスク(R)に形成されたパターンを基板(P)に転写する露光装置であって、前記基板が載置されるステージ装置(16)と；前記ステージ装置が着脱自在に搭載されるとともに中空構造を有する定盤(20)と；を備えたことを特徴とする。

【0012】ここで、「中空構造を有する」とは、定盤そのものが中空構造となっている場合のみでなく、定盤を設置床に設置した状態で設置床と定盤との間に空間が形成される場合をも含む趣旨である。

【0013】本請求項1に記載の発明によれば、基板が載置されるステージ装置が着脱自在に定盤上に搭載されていることから、ステージ装置を定盤上から取り外すこ

とにより、メンテナンス時の作業性が向上するとともに、ステージ装置を定盤上から取り外した状態で該露光装置を搬送することができるので、基板の大型化に伴ってステージ装置が大型化した場合であっても、搬送作業を容易に行うことができる。

【0014】この場合において、請求項2に記載の発明の如く、前記マスク(R)のパターン像を前記基板(P)上に投影する投影光学系(PL)と；前記投影光学系を保持するとともに、前記定盤に搭載された架台(18)と；を更に備えていても良い。かかる場合には、ステージ装置を定盤上から取り外すことにより、架台に保持された投影光学系あるいはそのまわりの光学部材、例えばアライメント系等のメンテナンス作業が容易になる。

【0015】この場合において、請求項3に記載の発明の如く、前記ステージ装置(16)は、前記基板(P)を保持して移動する移動部材(14)を有し、前記ステージ装置と前記架台(18)とは、それぞれ異なる防振部材(22、24)を介して前記定盤(20)に搭載されていることが望ましい。かかる場合には、ステージ装置と前記架台とは、それぞれ異なる防振部材を介して定盤に搭載されているので、移動部材の加減速時に生ずる反力に起因する振動が、架台側に伝わらなくなり、その振動に基づく投影光学系の光軸ずれ等が生じるのを防止することができる。

【0016】上記請求項1に記載の露光装置において、請求項4に記載の発明の如く、前記ステージ装置(16)が、ベース部材(40)と、このベース部材上を移動する移動部材(14)とを有する場合に、前記ベース部材の前記定盤(20)と対向する面に凹部(40a、40b)が形成されていても良い。かかる場合には、ベース部材の凹部に搬送用のフォークリフトのフォークを係合させることができるので、ステージ装置を定盤上の所望の位置に確実に搬送することができる。

【0017】

【発明の実施の形態】以下、本発明の一実施形態を図1、図2に基づいて説明する。図1には、一実施形態に係る露光装置10の構成が一部破断して概略的に示されている。

【0018】この露光装置10は、液晶ディスプレイ製造用のステップ・アンド・リピート方式の投影露光装置、いわゆる液晶ステッパである。

【0019】この露光装置10は、マスクとしてのレチクルRを照明する照明系12、レチクルRを保持してXY2次元面内で微動するレチクルステージRST、レチクルRのパターンを基板としてのガラスプレート(以下、「プレート」という)P上に投影する投影光学系としての投影レンズPL、及びプレートPを保持してXY2次元方向に移動する移動部材としての基板テーブル14を含むステージ装置16等を備えている。

【0020】この露光装置10では、照明系12、レチクルステージRST、投影光学系PL等は、同一の架台18に搭載されているが、ステージ装置16は架台18から分離されている。すなわち、架台18は、定盤20上に配置された防振部材としての複数の架台防振パッド22によって支持され、ステージ装置16は、定盤20上に配置された別の防振部材としての複数のステージ防振パッド24によって定盤20の上面に平行に、すなわち水平に支持されている。

10 【0021】前記照明系12は、不図示の光源、この光源で発光した光をその第2焦点位置に集光する楕円鏡12a、この楕円鏡12aで集光された光の特定の波長のみを選択的に透過させて露光光に変換する波長選択フィルタ、その露光光の照度を均一化するオブティカルインテグレート等を含む照度均一化光学系、視野絞り(レチクルブラインド)など(いずれも図示省略)を含み、所定波長の露光光によりレチクルRを均一な照度で照明する。この照明系12は、架台18の上面に照明保持部26を介して保持されている。

20 【0022】前記架台18の上壁の中央部には、上下方向に断面円形の開口18aが形成され、この開口18a内にその上端部にフランジ部28aが設けられたレンズ保持部28が上方から挿入され、架台18に保持されている。レンズ保持部28の中央部の上面側には所定深さの円形の凹部28bが形成され、この凹部28bの中央部に凹部28bより小径で上下方向に貫通する円形の開口28cが形成されている。この開口28c内に投影レンズPLの下部が挿入され、その軸方向中央やや下端寄りに設けられたフランジ部30が凹部28bの内底面に当接する状態で、投影レンズPLがレンズ保持部28によって保持されている。この場合、投影レンズPLの光軸AXと照明系12の光軸IXとが一致するように両者の調整がなされている。

30 【0023】レンズ保持部28の上面には、円筒状のレチクル系保持部32が立設され、このレチクル系保持部32の上面に前記レチクルステージRSTを支持するレチクルベース34が水平に固定されている。

【0024】レチクルステージRSTは、レチクルベース34上をモータ36A、36BによってXY2次元方向に微少駆動されるようになっている。また、このレチクルステージRST上方には、不図示のレチクル顕微鏡が内蔵されたレチクルアライメント部38が配置されている。

50 【0025】図2には、ステージ装置16の斜視図が示されている。この図2に示されるように、ステージ装置16は、矩形板状のベース部材40と、このベース部材40の上面にY方向に延設されたVフラットガイドに沿ってY方向に移動するYステージ42と、このYステージ42の上面にX方向に延設されたVフラットガイドに沿ってX方向に移動するXステージ44と、このXステ

ージ44の上面に搭載された前記基板テーブル14と、基板テーブル14の上面に位置決めローラによって位置決めされたプレートホルダ46とを備えている。Yステージ42は、送りねじ48Yを介してモータ50によって駆動され、Xステージ44は送りねじ48Xを介してモータ52によって駆動される。また、基板テーブル14は、不図示の駆動系によってZ軸方向に沿って上下動及びZ軸回りに微小駆動されるようになっている。また、基板テーブル14の上面にはX移動鏡54X及びY移動鏡54Yがそれぞれ固定され、これらを介して不図示のレーザ干渉計によって基板テーブル14の位置が計測される。

【0026】さらに、本実施形態では、ベース部材40の底面にY方向に所定長さで延びる一対の凹部40a、40bが形成されている。

【0027】図1に戻り、各ステージ防振パッド24の上面には、横断面が矩形の突起部24aが形成され、これに対応してベース部材40の底面には、突起部24aが嵌合する凹部40cが形成されている。すなわち、本実施形態では、ステージ装置16が、ステージ防振パッド24に対して着脱自在に搭載されるようになっているとともに、ステージ防振パッド24とステージ装置16との相対位置関係も一義的に定まるようになっている。

【0028】また、前記定盤20としては、図1に示されるように、所定間隔で断面矩形でY方向に延びる中空部が設けられたものが使用されている。この定盤20は、図1からもわかるように、ステージ防振パッド24と、架台防振パッド22との位置関係を所定の関係に規定する役目をも備えている。

【0029】さらに、プレートPの上方には、該プレートPの4つのコーナーに対向する位置に、プレートアライメントセンサPASが配置され、レンズ保持部28によって保持されている。

【0030】以上のようにして構成された本実施形態の露光装置10によると、プレートPが載置されるステージ装置16がステージ防振パッド24を介して着脱自在に定盤20上に搭載されていることから、ステージ装置16を定盤20上から取り外すことにより、レンズ保持部28の下方に大きなスペースを作ることができ、これにより投影レンズPL、プレートアライメントセンサPAS及びそれらに付属する光学部品等のメンテナンス時の作業性が向上する。また、定盤20として中空構造を有するものが用いられているので、この定盤20の中空部にフォークリフトのフォーク等の搬送部材を挿入することにより、露光装置10を組み立てたままの状態ですぐに搬送することができる。また、プレートPが大型化し、これに伴ってステージ装置16が大型化した場合であっても、ステージ装置16を定盤20上から取り外した状態でステージ装置16以外の部分を組み立てたままの状態ですぐに搬送することができる。

【0031】また、ステージ装置16と架台18とは、それぞれステージ防振パッド24、架台防振パッド22を介して定盤20に搭載されていることから、ステージ装置16を構成するXステージ44又はYステージ42の移動の際、例えば露光時のプレートPの位置決めの際のXステージ44又はYステージ42の加減速時に生ずる反力に起因する振動が、架台18側に伝わらなくなり、その振動に基づく投影レンズPLの光軸ずれ等が生じるのを防止することができ、これにより露光精度の向上を図ることが可能になる。

【0032】また、上記のようにステージ加減速時の反力に起因する振動が、架台18側に伝わらなくなるので、スルーブット向上のために、Xステージ44、Yステージ42の駆動速度を向上させる場合であっても、架台18及び照明保持部26、レンズ保持部28、レチクル系保持部32の剛性をあまり高くしなくても良いので、それらの部材の軽量化が可能になる。

【0033】また、ステージ装置16を構成するベース部材40の下面（定盤20と対向する面）に凹部40a、40bが形成されているので、図2に示されるように、ベース部材40の凹部40a、40bに搬送用のフォークリフトのフォーク60A、60Bに係合させることができ、これにより、ステージ装置16を定盤20上に位置決めされたステージ防振パッド24上に確実に搬送することができ、しかも、ステージ防振パッド24の上面の凸部24aに対しベース部材40下面の凹部40cを嵌合させることにより、ワンタッチでステージ装置40を所定の位置に位置決めすることができる。

【0034】また、ベース部材40の凹部40a、40bの寸法は、ステージ装置の搬送と露光装置10の搬送とを同じ搬送装置（フォークリフト）でできるように、定盤20の中空部の寸法と関連づけて決めるようにすれば良い。

【0035】なお、上記実施形態では、ステージ装置16が防振パッド24を介して定盤20上に着脱自在に搭載される場合について説明したが、本発明がこれに限定されることはなく、ステージ装置16が定盤20上に直接に着脱自在に搭載されていても良い。また、防振パッド24を介してステージ装置16が定盤20上に搭載される場合であっても、防振パッド24と定盤20とを着脱自在の構造にしても良い。

【0036】また、上記実施形態では、定盤20そのものが中空構造となっている場合について説明したが、これに限らず、定盤を設置床に設置した状態で設置床と定盤との間に空間が形成されるように、例えば定盤として少なくとも2本の足を有する底壁の存在しない形状のものを用いても良い。

【0037】また、上記実施形態では、本発明が液晶用ステップに適用された場合について説明したが、本発明の適用範囲がこれに限定されることはなく、半導体用の

露光装置、その他の露光装置にも本発明は好適に適用できるものである。

【0038】

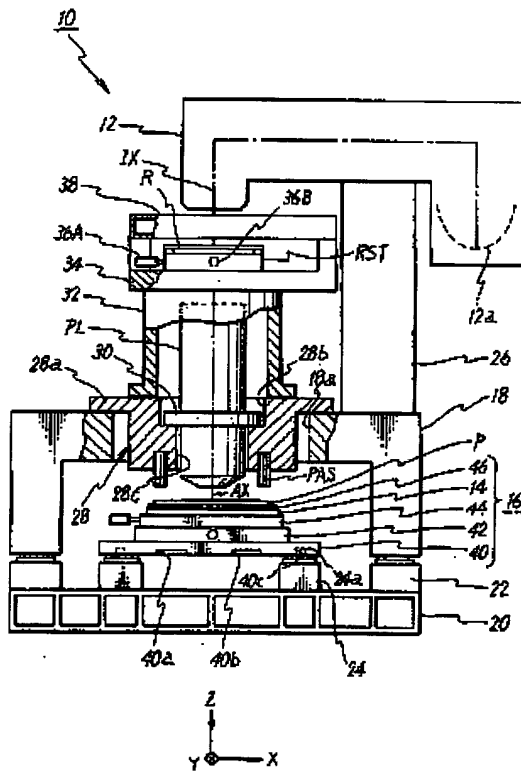
【発明の効果】以上説明したように、本発明によれば、搬送作業の容易化及び据え付け時間の短縮化並びにメンテナンス性の向上を図ることができるという優れた効果がある。

【図面の簡単な説明】

【図1】一実施形態の露光装置の全体構成を一部破断して概略的に示す図である。

*10

【図1】



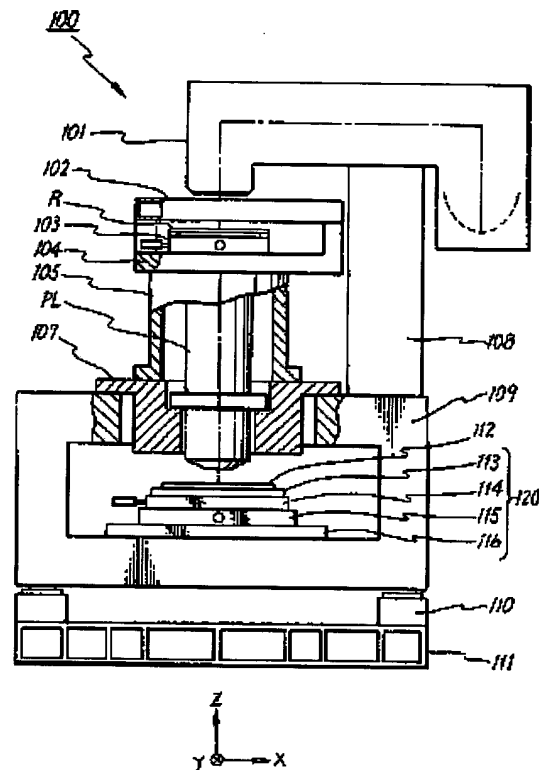
*【図2】図1のステージ装置を示す概略斜視図である。

【図3】従来例を示す説明図である。

【符号の説明】

10…露光装置、14…基板テーブル（移動部材）、16…ステージ装置、18…架台、20…定盤、22…架台防振パッド（防振部材）、24…ステージ防振パッド（防振部材）、40…ベース部材、40a、40b…凹部、R…レチクル（マスク）、P…プレート（基板）、PL…投影レンズ（投影光学系）

【図3】



【図2】

